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**FROM THE BOTTOM-UP:
REDESIGNING THE INTERNATIONAL LEGAL RESPONSE TO ANTHROPOGENIC
CLIMATE CHANGE**

ABSTRACT

The design of the *Kyoto Protocol* renders it incapable of effectively responding to the problem of anthropogenic climate change. Therefore, this article explores the opportunity to construct a new, principled legal approach to respond to climate change that is premised on nationally derived legal responses. To do so, this article considers the theoretical foundation of the international legal response to climate change – Hardin’s ‘The Tragedy of the Commons’ – and the systemic design faults of the *Kyoto Protocol*. This article also suggests four principles – a judicious mix of legal instruments, flexibility, intrinsic legal coherence, and quantifiable and achievable targets for the reduction of greenhouse gas intensity – that are necessary to guide the creation of a nationally derived legal response to climate change. This approach is intended to provide the catalyst for new bilateral and multilateral arrangements that can, with the passing of time, generate sufficient momentum to drive the creation of a new and effective cooperative international legal framework to mitigate anthropogenic climate change.

The *Kyoto Protocol*¹ is commonly portrayed as the most effective instrument to mitigate the challenges posed by anthropogenic climate change (“climate change”). In truth, however, the design and ambitions of the *Kyoto Protocol* mean that it is incapable of providing the catalyst to reduce the impact of the activities that are the primary contributors to climate change.² If the current international legal regime governing the global atmospheric commons is incapable of successfully mitigating climate change, then *what type of legal regime should replace it?* This is the central question to which this article responds. This article contends that the design failures of the international climate change law regime indicate that this regime must be replaced by a new legal approach that gains its momentum from the unilateral efforts initiated by nation-states. This approach allows nation-states to develop their own jurisdiction-specific responses to climate change without having to operate within a prohibitively broad consensus-based legal model that seeks to align the views of a disparate body of nations. By adopting this approach, nation-states can then use their domestic

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¹ *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, opened for signature 16 March 1998 (entered into force on 16 February 2005) (“the *Kyoto Protocol*”).

² See, eg, S Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds), ‘Climate Change 2007: The Physical Science Basis’ (Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Intergovernmental Panel on Climate Change, 2007); ‘Climate change in Australia - Technical Report 2007’ (CSIRO, 2007); Kurt Kleiner, ‘Climate Science in 2009’ (2009) 4 *Nature* 4; A. Barrie Pittock, *Climate Change: The Science, Impacts and Solutions* (CSIRO Publishing, 2nd ed, 2009).

experience to generate momentum for multilateral arrangements that, over time, can provide the catalyst for a new international regime.

The central proposition of this article is explored over two sections. Section one considers the dominant view among climate change scholars that climate change is a global problem that must be addressed using a global response. Part (a) of section one reviews the theoretical basis underpinning the support for international action on climate change – Hardin’s ‘The Tragedy of the Commons’.³ Part (a) then moves to consider the dominant regulatory responses developed to overcome Hardin’s tragedy.

Part (b) of the first section assesses the major shortcomings of the current international climate change law regime. This analysis concludes that the shortcomings of the *Kyoto Protocol* render it incapable of delivering the economic, societal and environmental changes required to mitigate climate change.

Part (c) of this section considers the characteristics that make nation-states suitable to lead the transition to a low-emissions economy.

Section two of this article considers the underlying legal principles that must inform national legal regimes that address climate change. The purpose of identifying these principles is not to prescribe the specific structure and design of the national legal arrangements. Rather, it is to draw attention to the principles that must permeate the new national legal arrangements for them to mitigate climate change.

Throughout this article, examples are drawn from the electricity generation sector (“the electricity sector”) to provide practical applications of the otherwise theoretical foundations of this article’s contention. The electricity sector has been chosen because it is currently the largest global sectoral emitter, contributing approximately 32 per cent of global anthropogenic greenhouse gas emissions (“greenhouse gas emissions”).⁴ Further, without significant modifications to the fuels and technologies used to generate electricity, the growing demand for electricity will increase this sector’s contribution to climate change.⁵ For these reasons, the electricity sector is central to any effort to mitigate the problem of climate change.

While this article draws on examples from the electricity sector, it is important to recognise that no single economic sector is capable of offering a solution to the problem of climate change. Put differently, significant economy-wide efforts remain necessary to avoid the dangerous tipping points that scientists contend will occur without effective and timely mitigation of this problem.⁶

³ Garrett Hardin, ‘The Tragedy of the Commons’ (1968) 162(3859) *Science* 1243.

⁴ ‘Energy Technology Perspectives 2010: Scenarios and Strategies to 2050’ (International Energy Agency, 2010), 102.

⁵ *Ibid.*, 55. In recognition of the electricity sector’s role in decarbonising the global economy, the International Energy Agency has noted that “decarbonising the power sector will be at the heart of efforts to make deep cuts in global [anthropogenic greenhouse gas] emissions” (see *ibid.*, 55). Climate change scholars have therefore posited that the energy sector “should take the lead as the primary factor responsible for future decarbonisation of economic activity” (see, Gwyn Prins et al, ‘The Hartwell Paper: A new direction for climate policy after the crash of 2009’ (University of Oxford and the London School of Economics, 2010), 24).

⁶ See, eg, Intergovernmental Panel on Climate Change, ‘Climate Change 2007: Synthesis Report’ (Intergovernmental Panel on Climate Change, 2007); Michael E Mann, ‘Defining dangerous anthropogenic interference’ (2009) 106(11) *Proceedings of the National Academy of Sciences* 4065; Brian O’Neill, Keywan Riahi and Ilkka Keppo, ‘Mitigation implications of midcentury targets that preserve long-term climate policy

I A GLOBAL RESPONSE TO CLIMATE CHANGE

A Theoretical Basis: 'The Tragedy of the Commons'

The theoretical basis underpinning the global response to climate change is premised on Garrett Hardin's seminal piece 'The Tragedy of the Commons'.⁷ The central thesis posited by Hardin is that common or 'open access' resources – which Hardin refers to as the commons – are overexploited and, as a result, destroyed.⁸

Hardin explains the tragedy of the commons by considering the oft-cited hypothetical in which a "pasture [which, in this scenario, is the open access resource] is open to all [and where] ... each herdsman, will try to keep as many cattle as possible on the commons".⁹ Hardin notes that "[a]s a rational being, each herdsman seeks to maximise his gain"¹⁰ by placing more cattle on the common property because, by doing so, he receives a direct benefit but is only liable for a fraction of the costs attributable to the overgrazing of the land. Eventually, a tragedy occurs because the pasture is depleted as a result of the self-interest pursued by each herder, whose activities remain unrestricted by government regulation.¹¹

Climate change scholars regard the rationale underpinning Hardin's tragedy of the commons as an apt analogy for the problem of climate change.¹² In this scenario, the earth's atmosphere is the global common that, without government intervention limiting access to this resource, remains unprotected. It is now well settled that climate change is at least partially caused by human activities that emit greenhouse gases into the earth's atmosphere (including, for example, the combustion of fossil fuels to generate electricity).¹³ The tragedy in relation to the earth's atmosphere occurs because, without effective government intervention, no single emitter has an incentive to reduce its greenhouse gas emissions. The reason for this is, like Hardin's herdsmen, reducing these emissions from one's own plant only serves to reduce one's own benefits without appreciably preventing the despoliation of the earth's atmosphere.¹⁴ As a result, "this [self interest] leads inexorably to the degradation of the atmospheric commons"¹⁵ as the culmination of greenhouse gases in the earth's atmosphere causes severe global climatic changes.¹⁶

options' (2010) 107(3) *Proceedings of the National Academy of Sciences* 1011; James Hansen et al, 'Target Atmospheric CO₂: Where Should Humanity Aim?' (2008) 2 *Open Atmospheric Science Journal* 217.

⁷ Hardin, above n 3.

⁸ *Ibid.*, 1244.

⁹ *Ibid.*

¹⁰ *Ibid.*

¹¹ *Ibid.*

¹² See, eg, John Hasnas, 'Two Theories of Environmental Regulation' (2009) 26 *Social Philosophy and Policy* 95; Richard B Stewart, 'Environmental Regulation and International Competitiveness' (1993) 102 *Yale Law Journal* 2039; Barton H Thompson Jr, 'Tragically Difficult: The Obstacles to Governing the Commons' (2000) 30 *Environmental Law* 241; Kirsten Engel and Scott R Saleska, 'Subglobal Regulation of the Global Commons: The Case of Climate Change' (2005) 32 *Ecology Law Quarterly* 183.

¹³ Intergovernmental Panel on Climate Change, above n 6, 39-40; BD Santer and TML Wigley, 'Progress in Detection and Attribution Research' in Stephen H Schneider et al (eds), *Climate Change Science and Policy* (Island Press, 2010).

¹⁴ Engel and Saleska, above n 12, 191.

¹⁵ *Ibid.*, 190.

¹⁶ Intergovernmental Panel on Climate Change, above n 6.

Following Hardin's 'Tragedy of the Commons', most climate change scholars contend that an effective legal response to climate change must be proportionate to the problem. On this basis, the global scope of the tragedy of the atmospheric commons requires a global response to ensure that all contributing 'herdsmen' are engaged in the solution.¹⁷ Climate change scholars therefore regard unilateral or multilateral action as irrational because "free-riding problems plague unilateral or multilateral "solutions""¹⁸ to a global problem. A further disincentive for individual state-based action is that

nations will not benefit proportionately from greenhouse-gas abatement policies. In fact, some countries ... might experience no benefits from control, since they actually stand to gain from global climate change.¹⁹

While the majority of climate change scholars hold that a global response to climate change is the accepted course of action, they remain divided between the two dominant regulatory responses that have emerged to address the tragedy of the atmospheric commons: direct regulation and market-based regulation.²⁰ Direct regulation imposes a rule that prescribes specifically how an entity must act in order to mitigate its contribution to climate change.²¹ Despite historical support for this approach (which existed up until the mid-1980s), direct regulation is no longer regarded as the leading regulatory tool to address Hardin's tragedy because of the view that this approach is overly rigid and expensive.²²

Market-based mechanisms have therefore emerged as the more popular regulatory tool to address Hardin's tragedy.²³ This approach "encourage[s] behaviour through market signals, rather than through explicit directives regarding pollution control levels or methods".²⁴ This can be achieved either through the imposition of a tax on greenhouse gas emissions²⁵ or

¹⁷ See, eg, Warwick J McKibbin and Peter J Wilcoxon, 'A credible foundation for long term international cooperation on climate change' (2006) *Lowy Institute (Working Papers in International Economics, June 2006 No 106)*; John K Setear, 'Collapse: Can International Law Protect The Earth's Natural Resources' (2007) 101 *American Society of International Law Proceedings* 171; Philippe Sands QC, *Principles of International Environmental Law* (Cambridge University Press, 2nd ed, 2003).

¹⁸ Robert N Stavins, 'Policy Instruments for Climate Change: How can National Governments Address a Global Problem?' (97-11, Resources for the Future, 1997), 7.

¹⁹ Ibid.

²⁰ While other techniques have also been suggested to respond to the problem of climate change, privatising the commons and direct regulatory action are the two techniques that dominate the climate change discourse.

²¹ Robert Revesz and Robert N Stavins, 'Environmental Law' in Kenneth J Arrow et al (eds), *Handbook of Law and Economics* (Elsevier, 2007), vol 1, 536.

²² Robert W Hahn and Gordon L Hester, 'Where Did All the Markets Go? An Analysis of the EPA's Emissions Trading program' (1989) 6(1) *Yale Journal on Regulation* 109, 109; James Tripp and D J Dudek, 'Institutional Guidelines for Designing Successful Transferable Rights Programs' (1989) 6 *Yale Journal on Regulation* 369; Neil Gunningham, 'Environmental Law, Regulation and Governance: Shifting Architectures' (2009) 21(2) *Journal of Environmental Law* 179, 184. Another common criticism of prescriptive regulation is that it does not engender technological innovation, which can lead to high compliance costs for regulated entities.

²³ Harold Demsetz, 'Toward a Theory of Property Rights' (1967) 57(2) *The American Economic Review* 347; Daniel H Cole, 'Clearing the Air: Four propositions about property rights and environmental protection' (2000) 10 *Duke Environmental Law and Policy Forum* 103; Bruce Yandle and Andrew P Morriss, 'The Technologies of Property Rights: Choice Among Alternative Solutions to Tragedies of the Commons' (2001-2002) 28 *Ecology Law Quarterly* 123.

²⁴ Robert N Stavins, 'Market-Based Environmental Policies: What Can We Learn from U.S. Experience (and Related Research)?' in Jody Freeman and Charles D Kolstad (eds), *Moving to markets in environmental regulation: Lessons from twenty years of experience* (Oxford University Press, 2007), 19.

²⁵ Arthur C Pigou, *The Economics of Welfare* (Cosimo Inc, 1920). A tax increases the production costs of firms that emit greenhouse gas emissions. The imposition of a tax therefore encourages the entity being taxed to reduce the amount of greenhouse gases it emits or, alternatively, alter its production process to minimise the cost of the tax (see Frank Muller and J Andrew Hoerner, 'Greening State Energy Taxes: Carbon Taxes for Revenue and the Environment' (1994) 12(1) *Pace Environmental Law Review* 5, 9).

through the creation of a market in tradeable greenhouse gas emission permits.²⁶ Both of these approaches internalise the costs of greenhouse gas emissions²⁷ for emitters and, as a result, encourage the reduction of these emissions.

The global approach to the tragedy of the commons together with the reliance on a tradeable permit scheme inform the design of the international climate change legal arrangements created under the *United Nations Framework Convention on Climate Change*²⁸ (“the UNFCCC”) and the *Kyoto Protocol*. It is to these instruments, and in particular the *Kyoto Protocol*, to which this study now turns.

B *The Inadequacy of the Modern International Climate Change Regime*

The birth of the modern day international climate change regime occurred in 1992 with the adoption of the UNFCCC. The preamble to the UNFCCC notes that the “change in the earth’s climate and its adverse effects are a common concern of humankind”²⁹ and, as such, it is committed to “protect[ing] the climate system for present and future generations”.³⁰

In 1995, at the first Conference of the Parties to the UNFCCC, the parties commenced negotiations to solidify the underlying principles advocated in this document and, more particularly, to agree on stringent greenhouse gas emission reduction targets for industrialised nations. On the basis of these negotiations, the *Kyoto Protocol* was adopted on 11 December 1997 by a unanimous vote of the UNFCCC signatory parties. The *Kyoto Protocol* subsequently took effect on 16 February 2005 following the ratification by the Russian Federation in November 2004.

The *Kyoto Protocol* is designed to achieve a five per cent reduction of global greenhouse gas emissions below 1990 levels during its first commitment period, which began in 2008 and which ends in 2012.³¹ The *Kyoto Protocol* also envisages further commitment periods beyond 2012.³² To achieve its primary objective, the *Kyoto Protocol* supports the use of three flexibility mechanisms – emissions trading, clean development mechanisms and joint implementation – which are intended to provide flexibility to parties to, among other things,

²⁶ John H Dales, *Pollution, property and prices: An essay in policy-making and economics* (University of Toronto Press, 1968). Dales’ tradeable permit system is premised on the creation of privately owned ‘pollution rights’ which permit the holder to emit predetermined amounts of greenhouse gases which corresponds with an aggregate jurisdiction-wide cap on these emissions. The pollution rights are assigned a value and are distributed to liable firms. At the end of each specified compliance period, firms must provide to the regulatory authority the number of pollution rights corresponding to their greenhouse gas emissions for that period. To provide flexibility, a secondary market is created where the pollution rights can be traded between entities. This encourages firms for which abatement measures are relatively inexpensive to reduce their greenhouse gas emissions and sell their excess pollution rights to firms for whom it is more expensive to reduce these emissions.

²⁷ Internalising the cost of greenhouse gas emissions means to impose on the emitting entity the cost of its emissions. By doing so, the cost of the emissions is no longer shared by society at large but, instead, is the obligation of the emitting entity.

²⁸ *United Nations Framework Convention on Climate Change*, opened for signature on 4 June 1992, 31 ILM 849 (entered into force on 21 March 1994).

²⁹ *Ibid*, Preamble.

³⁰ *Ibid*.

³¹ *Kyoto Protocol*, above n 1, Article 3.

³² Negotiations are continuing in relation to the future of the *Kyoto Protocol*. However, these continue to be problematic (see, eg, Daniel Bodansky, ‘The Copenhagen Climate Change Conference: A Postmortem’ (2010) 104 *The American Journal of International Law* 230).

achieve their emission reduction targets at minimum cost.³³ In addition, the *Kyoto Protocol* calls on its signatories to develop and implement domestic action to meet its obligations.³⁴

At first glance, the principles underpinning the international legal response to climate change appear well designed. They address the problem of climate change through the forum of international law and so abide with the common view that the tragedy of the atmospheric commons requires a global solution. Further, the flexibility mechanisms rely on market-based mechanisms to privatise the atmospheric commons. However, when the principles informing this legal regime are considered in more detail, it is evident that the current international legal response is not only inappropriate, but also ineffective.

Before considering the shortcomings of the *Kyoto Protocol*, it is important to note that the purpose of the following analysis is not to assess the greenhouse gas emission targets set by this instrument nor is it to consider whether developed (or, as they are defined in the *Kyoto Protocol*, Annex I) countries are likely to meet these targets during the first commitment period. Rather, the purpose of this analysis is to consider the foundational principles of the *Kyoto Protocol*. In doing this, it becomes evident that the design of this legal instrument is incapable of decarbonising the global economy.

There are three key evaluative criteria that can assist us to understand the magnitude of the shortcomings of the international climate change regime.³⁵ The first criterion relates to whether the full extent of the problem is accurately defined.³⁶ This is the most critical of the three criteria because a failure to identify the problem is likely to result in a misdiagnosis of the problem and, therefore, deliver misinformed responses.³⁷ The second criterion requires clear and precise action to be taken in response to the identified source of the problem.³⁸ The third criterion requires a consideration of whether the treaty is able to have a beneficial and practical impact on the source of the problem.³⁹

By applying the first two criteria to the *Kyoto Protocol*, it is evident that this instrument “offers the wrong diagnosis”⁴⁰ as it “treats the symptoms [being greenhouse gas emissions] and not the cause [being the activities that cause greenhouse gas emissions]”.⁴¹ Therefore, this legal instrument does not offer a suitable solution to the real cause of the problem. This distinction is subtle and is worth exploring in more detail.

As this article has already stated, climate change occurs as a result of the activities that produce greenhouse gas emissions. Logically it must follow therefore that a response to this

³³ Clean Development Mechanisms (“CDMs”) and Joint Implementation (“JI”) are project-based mechanisms that allow parties to generate international emissions permits by participating in compliant projects. The permits created by these projects can be used to meet *Kyoto Protocol* obligations as well as obligations under *Kyoto Protocol*-compliant trading schemes. The chief difference between CDMs and JIs is that the former must be conducted in a developing (or a non-Annex I) country. JIs, on the other hand, must be undertaken in developed (or Annex I) countries. Emissions trading is a form of tradeable permit system that involves trading greenhouse gas emission credits. Allowances are assigned to individual signatories of the *Kyoto Protocol*, thereby making emissions a commodity that can be traded under a tradeable permit scheme.

³⁴ *Kyoto Protocol*, above n 1, Articles 5, 7 and 8.

³⁵ Setear, above n 17, 176.

³⁶ *Ibid.*

³⁷ *Ibid.*

³⁸ *Ibid.*

³⁹ *Ibid.*, 176-177.

⁴⁰ *Ibid.*, 178.

⁴¹ *Ibid.*, 178. See also Steven Ferrey, 'The failure of international global warming regulation to promote needed renewable energy' (2010) 37 *Environmental Affairs* 67.

problem must be designed to address these underlying activities, rather than be concerned with the emissions themselves. It is for this reason that the *Kyoto Protocol* would have been more effective if its founders had considered and addressed the reasons why greenhouse gas emissions are produced.⁴² By doing this, the *Kyoto Protocol* could have had as its central principle the development of laws and policies for securing low-emissions technologies to replace the existing emissions-intensive fossil fuel-sourced technologies.⁴³ However, with its current design, the *Kyoto Protocol* is impotent to shift the “world’s energy base to renewable power in lieu of fossil-fuel-fired power resources”⁴⁴ because it has misdirected its focus towards the symptoms and not the cause of climate change.⁴⁵

The second fundamental flaw of the *Kyoto Protocol* – which goes to the third criterion – is that this legal framework seeks to engage all of the world’s governments in order to achieve meaningful reductions in greenhouse gas emissions. While the majority of climate change scholars support Hardin’s global approach, Prins and Rayner note that the design of the current international legal regime “has the ring of idealistic symmetry”.⁴⁶ In reality, this approach means that the “more parties there are to a negotiation, the lower the common denominator for [an effective] agreement”⁴⁷ which means that the beneficial and practical impacts of the *Kyoto Protocol* are limited. This shortcoming is explored further in the context of global participation under the *Kyoto Protocol*.

Under the *Kyoto Protocol*, developed countries are generally required to reduce their greenhouse gas emissions by five to 10 per cent below 1990 levels during the first commitment period. Developing countries, on the other hand, have no such obligation.⁴⁸ The rationale for this is that developed countries have historically been the beneficiaries of the activities that have contributed to climate change and therefore should carry the burden of mitigating the problem to which they were the largest contributors. While this approach does have some merit, the IEA projects that

nearly all of the growth in global emissions ... comes from outside of the OECD [Annex I countries]. Emissions from non-OECD [non-Annex I countries] countries grow from 15 Gt [carbon dioxide] in 2007 to 42 Gt [carbon dioxide] in 2050. OECD emissions grow from 14 Gt [carbon dioxide] to 15 Gt [carbon dioxide during the same time].⁴⁹

As a result, the failure to impose specific obligations on developing countries and, more importantly, specifically engage them in the process of responding to climate change, renders the *Kyoto Protocol* useless as a long-term global solution to this problem.⁵⁰ The problem of broad international engagement is further compounded by the refusal of the United States of America, one of the largest emitters of greenhouse gas emissions, to participate in the *Kyoto*

⁴² Setear, above n 17, 180.

⁴³ Ferrey, above n 41, 68. Guruswamy extends his criticism of the *Kyoto Protocol* by noting that as a result of the above-stated misdiagnosis, the *Kyoto Protocol* also fails to address the electricity sector’s reliance on the finite commodities of oil, coal, gas and uranium, which are the dominant fuels used to generate electricity (see Setear, above n 17, 178). This failure is exacerbated by the IEA’s projection that demand for electricity will increase by 84 per cent by 2050, which means that there is a pressing need for new infrastructure that breaks the world’s reliance on fossil fuel-sourced electricity (see International Energy Agency, above n 4, 90).

⁴⁴ Ferrey, above n 41, 68.

⁴⁵ Ibid.

⁴⁶ Gwyn Prins and Steve Rayner, 'Time to ditch Kyoto' (2007) 449 *Nature* 973, 974.

⁴⁷ Ibid. See also Setear, above n 17, 179-180.

⁴⁸ *Kyoto Protocol*, above n 1, Articles 4 and 10.

⁴⁹ International Energy Agency, above n 4, 72.

⁵⁰ Setear, above n 17, 179-180.

Protocol.⁵¹ Together these problems lend weight to the view that the *Kyoto Protocol* is incapable of adequately responding to the problem of climate change. Adopting the language first used by Hardin, Engel posits that these failures mean that “the herders in Hardin’s parable have agreed to abide by collectively established limits on herd size, but the biggest herder[s] of all [have] refused to participate”.⁵²

The shortcomings of the *Kyoto Protocol* have resulted in an instrument that is incapable of effectively mitigating climate change. Further, the failure of the *Kyoto Protocol* to engage ‘the biggest herders’ means that this response to Hardin’s tragedy is not a true international response and, therefore, does not effectively address the tragedy of the atmospheric commons.

The failures of the *Kyoto Protocol* raise the question that was first asked in this article’s introduction: *if the design of the current international legal regime is unable to mitigate climate change effectively, what type of legal regime should replace it?* The following section responds to this question by submitting that nation-states must exert their sovereign powers to mitigate climate change that, over time, can provide the catalyst for a new multi-national response to this problem.⁵³

C *The Role of National Legal Regimes to Respond to Climate Change*

The shortcomings of the international climate change regime mean a new strategy is required – one that emerges from the exercise of a nation state’s sovereign powers – to manage the problem of the global atmospheric commons.⁵⁴ Supra-national, national and sub-national actors such as the European Union, the United Kingdom and California have, for some time, been developing regulation to respond to the problem of climate change that extends beyond the scope of the international climate change regime. By doing so, these jurisdictions have triggered action (or, in the case of California, support for action) at “higher jurisdictional levels of government encompassing a larger geographic scope”.⁵⁵

The following paragraphs consider examples of the sovereign power of nation-states that can provide the catalyst for the emergence of a new approach to managing climate change which emerges from the bottom-up.⁵⁶

⁵¹ United Nations Statistics Division, *Carbon dioxide emissions (CO₂), thousand metric tons of CO₂ (CDIAC)* (2010) United Nations, Statistics Division <<http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749&crd=>> at 30 September 2010.

⁵² Engel and Saleska, above n 12, 193.

⁵³ Lorraine Elliot, 'Sovereignty and the Global Politics of the Environment: Beyond Westphalia?' in Trudy Jacobsen, Charles Sampford and Ramesh Thakur (eds), *Re-envisioning Sovereignty: The End of Westphalia?* (Ashgate, 2008) 193, 198.

⁵⁴ The concept of sovereignty is being challenged by the growing interdependence of nation-states and the prevalence of globalised challenges (including, for example, climate change). For this reason, state sovereignty no longer means “supreme authority, granting a state exclusive jurisdiction and control over all objects and subjects in its territory, to the exclusion of any other influence” (see Jackson Nyamuya Maogoto, 'Westphalian Sovereignty in the Shadow of International Justice? A Fresh Coat of Paint for a Tainted Concept' in Trudy Jacobsen, Charles Sampford and Ramesh Thakur (eds), *Re-envisioning Sovereignty: The End of Westphalia?* (Ashgate, 2008) 211, 211). Rather, sovereignty is now considered to be a fluid concept that strikes a “balance between the needs of good internal governance and the requirements of an even more interdependent world” (see Boutros Boutros-Ghali, *An Agenda for Peace 1995* (United Nations, 2nd ed, 1995), 44). For a more detailed discussion of sovereignty and its development in the globalised international environment, see Jacobsen, Sampford and Thakur, above n 53.

⁵⁵ Engel and Saleska, above n 12, 223.

⁵⁶ *Ibid.*

A nation-state (and, more particularly, a national government) is capable of providing the catalyst to manage effectively the responses to climate change because

it owns and manages a significant number of assets ...; its programs affect the ability of others to adapt; it is an important provider of technical, fiscal, and other support; and it plays a crucial role in dealing with impacts that cross geographic or jurisdictional boundaries.⁵⁷

While these four reasons form the basis of national responses to climate change, it is important to consider, by way of two prominent examples, the different ways in which these factors can affect the role of national governments to mitigate this problem.

One such example is the power of national governments to remove market barriers and, more particularly, subsidies that create distortive price signals, resulting in barriers to entry for renewable energy technologies.⁵⁸ By removing these barriers, which are common in both developed and developing economies, existing market distortions favouring the use of emissions-intensive fuels for electricity, for example, could be removed.⁵⁹ Taking this action would be a substantial step in overcoming the cost disparity between fossil fuel-sourced and renewable-sourced electricity.

A further example of the power that national governments have in mitigating climate change is the role they can play in addressing cross-jurisdictional issues. Take Australia, for example, in which each state and territory has implemented a small-scale feed-in tariff to support the dissemination of renewable energy technologies.⁶⁰ If the federal government adopted a national market-based approach to encourage the deployment of renewable energy technologies, it would deliver to participants a larger, uniform and more competitive market to support the dissemination of small-scale renewable energy technologies.⁶¹

National governments must therefore recognise that they are capable of utilising their sovereign powers to develop an appropriate legal approach to mitigate climate change. By doing so, they can then begin to develop a national approach to mitigate climate change which can provide the catalyst for bilateral and multilateral legal arrangements which extend beyond the scope of their national programs. However, until nation-states take ownership of the response to climate change, it is unlikely that an international legal response will progress beyond a theoretically ideal approach that fails in practice.

II PRINCIPLES REQUIRED TO DEVELOP AN APPROPRIATE NATIONAL RESPONSE TO CLIMATE CHANGE

⁵⁷ Joel B Smith et al, 'Adapting to Climate Change: A Call for Federal Leadership' (Pew Center on Global Climate Change, 2010), 2.

⁵⁸ International Energy Agency, Organisation of the Petroleum Exporting Countries, Organisation for Economic Co-operation and Development and The World Bank, 'Analysis of the Scope of Energy Subsidies and Suggestions for the G-20 Initiative' (International Energy Agency, Organisation of the Petroleum Exporting Countries, Organisation for Economic Co-operation and Development and The World Bank, 2010), 8.

⁵⁹ See, eg, Chris Riedy, 'Subsidies that Encourage Fossil Fuel Use in Australia' (Institute for Sustainable Futures, University of Technology, Sydney, 2007); International Energy Agency, *Energy Subsidies: Getting the Prices Right* (2010) International Energy Agency <http://www.iea.org/files/energy_subsidies.pdf> at 21 October 2010; International Energy Agency et al, above n 58.

⁶⁰ A feed-in tariff mechanism is a price-based energy supply mechanism that is focused on supporting the development of new renewable energy projects. It does this by offering a regulated financial rate of return (or profit) for electricity that is generated by eligible renewable sources which is paired with a long-term purchase agreement for the sale of electricity that is generated by these sources (see Toby D. Couture et al, 'A Policymaker's Guide to Feed-in Tariff Design' (Technical Report NREL/TP-6A2-44849, National Renewable Energy Laboratory, 2010), 6).

⁶¹ Engel and Saleska, above n 12, 228.

For national regimes to create an effective legal response to climate change, each of these emerging national regimes must be crafted according to a set of consistent legal principles. On this basis, this section considers the following four key principles that are required to guide the emergence of a new climate change legal model: (i) a set of strategically selected legal instruments; (ii) flexibility; (iii) intrinsic legal coherence; and (iv) quantifiable and achievable targets for the reduction of greenhouse gas intensity. These principles operate to inform the specific national legal arrangements that are developed to mitigate climate change. They are therefore not designed to prescribe exact formulations of laws that can be applied readily.

The first, and arguably most important, principle for the design of an effective climate change legal framework is that it relies on a *combination of strategically selected instruments* that specifically target the problem sought to be overcome.⁶² By utilising a combination of instruments – including both prescriptive and market-based forms of regulation – the newly-designed legal framework can address the central problem that the *Kyoto Protocol* has failed to solve in the most flexible, direct, predictable and cost-effective manner.⁶³ The combination of prescriptive and market-based regulation provides a useful counterbalance as prescriptive “regulation [contributes] the virtues of high dependability and predictability”⁶⁴ while economic instruments ensure efficiency. An example drawn from the Australian electricity context indicates how a single legal instrument is incapable of achieving the required levels of mitigation to respond to the problem of climate change.

In 2000, the federal government introduced the Mandatory Renewable Energy Target (“MRET”) scheme. This scheme remains the only national legal approach in Australia to reduce the electricity sector’s contribution to climate change.⁶⁵ The purpose of the MRET scheme was to impose a mandatory obligation on electricity retailers to “source an additional 2 per cent of their electricity from renewable ... sources by 2010”.⁶⁶ In 2009, the federal government amended this scheme (which at the same time was renamed the Renewable Energy Target (“RET”) scheme) to ensure that 20 per cent of Australia's electricity supply is generated from renewable energy sources by 2020.⁶⁷

⁶² Neil Gunningham, Peter Grabosky and Darren Sinclair, *Smart Regulation: Designing Environmental Policy* (Clarendon Press, 1998), 387.

⁶³ James Prest, 'A dangerous obsession with least cost? Climate change, renewable energy law and emissions trading' in Wayne Gumley and Trevor Daya-Winterbottom (eds), *Climate Change Law: Comparative, Contractual & Regulatory Considerations* (Lawbook, 2009) 179; *Ibid*, 387.

⁶⁴ Gunningham, Grabosky and Sinclair, above n 62, 388.

⁶⁵ *Renewable Energy (Electricity) Act 2000* (Cth). Under the MRET scheme, wholesale purchasers of electricity on grids with a capacity greater than 100 megawatts were required to acquire renewable energy certificates (or RECs) equivalent to a percentage of their annual electricity purchases and to surrender these certificates to the regulator on an annual basis. RECs represent renewable-based electricity that has been generated and consumed anywhere in Australia. The scheme is supported by the operation of a secondary market for the trading of RECs. The operation of this secondary market alleviates the need for liable firms to self-generate or physically purchase energy from renewable energy sources. The secondary market also provides renewable electricity generators with a transparent system through which to sell the RECs that they have received as a result of generating renewable electricity. In addition to the federal renewable electricity scheme, the Victorian and Queensland governments have also taken action to increase the use of low-emissions technology for electricity generation.

⁶⁶ Explanatory Memorandum, *Renewable Energy (Electricity) Bill 2000* (Cth), 5.

⁶⁷ *Renewable Energy (Electricity) Act 2000* (Cth), s 40.

Under the RET scheme, total renewable energy generation is projected to reach 66,000 GWh in 2020, up from 27,000 GWh in 2010.⁶⁸ On the basis of these projections, renewable electricity is expected to contribute approximately 22 per cent of Australia's total electricity generation in 2020.⁶⁹ Translating this into greenhouse gas emissions, the federal government projects that by 2020 this scheme will reduce Australia's total emissions by approximately 35 Mt from 2000 levels.⁷⁰ However, for Australia to reduce its greenhouse gas emissions by 25 per cent from 2000 levels by 2020 (which agreement is conditional on a binding global agreement) Australia must eliminate a total of 255 Mt of greenhouse gas emissions.⁷¹ The projected emission reductions resulting from the RET scheme will only constitute 14 per cent of that total. Given that the electricity sector contributes approximately 35 per cent of Australia's current greenhouse gas emissions,⁷² a 14 per cent contribution to Australia's reduction commitment is substantially less than the electricity sector's contribution to Australia's overall greenhouse gas emissions profile.⁷³

Further, even if Australia does not increase its commitment beyond a five per cent reduction in greenhouse gas emissions by 2020 from 2000 levels, Australia must still eliminate a total of 144 Mt of greenhouse gas emissions. The projected emission cuts resulting from the RET scheme will constitute only 24 per cent of that total. Even this figure remains disproportionate to the electricity sector's contribution to Australia's greenhouse gas emissions profile. On this basis, Australia is more likely to decarbonise its electricity sector by using multiple and complementary legal instruments that collectively shift Australia's electricity sector to a lower emissions base.

A major challenge to the use of multiple instruments is that it can create a level of regulatory "smorgasbordism".⁷⁴ Therefore, the second key principle to consider is that when choosing the regulatory instruments it is critical to maintain *intrinsic legal coherence*. This means that the chosen mix of regulatory instruments must be complementary, or at least capable of coexisting with one another, in order to create an effective climate change legal model. Intrinsic legal coherence also requires that the new legal framework is effectively integrated with the established legal arrangements. Integration with existing laws is critical because the new legal framework cannot operate effectively without interacting and coexisting with a range of established and emerging legal rules relating to, among others things, property law, securities law, trade practices law, environmental law and planning and resources law.

International integration is also a critical component for an effective legal framework that is capable of addressing the problem of climate change. By designing a legal framework that has the flexibility to integrate and co-exist with foreign legal arrangements, it means that the national legal framework can support multilateral and, in the long-term, international

⁶⁸ Walter Gerardi, 'Impacts of Changes to the Design of the Expanded Renewable Energy Target' (McLennan Magasanik Associates, 2010), 21. In terms of the contribution made by large and small-scale technologies, large-scale technologies are projected to contribute 39,000 GWh and small-scale ones approximately 11,000 GWh. The remaining 16,000 GWh is made up of the renewable electricity sources existing prior to the RET scheme.

⁶⁹ Ibid, 21.

⁷⁰ Department of Climate Change and Energy Efficiency, Australian Government, 'Australia's Fifth National Communication on Climate Change: A report under the United Nations Framework Convention on Climate Change' (Department of Climate Change and Energy Efficiency, Australian Government, 2010), 78.

⁷¹ Ibid, 89.

⁷² Department of Climate Change and Energy Efficiency, *National Greenhouse Gas Inventory* Department of Climate Change and Energy Efficiency <<http://ageis.climatechange.gov.au/NGGI.aspx>> at 2 June 2010

⁷³ Ibid.

⁷⁴ Gunningham, Grabosky and Sinclair, above n 62, 389.

approaches to mitigate climate change. Therefore, for these national initiatives to be effective they must not only operate effectively within the confines of the established domestic legal framework, they must also be able to interact and support other foreign domestic regimes that have similar objectives.

The third core design principle is *flexibility*. Flexibility allows the legal framework to respond to the evolving discipline of climate change science and the developing knowledge relating to technological responses to climate change.⁷⁵ While it is well settled that human behaviour is at least partially responsible for increased global temperatures,⁷⁶ questions relating to climate sensitivity (the direct relationship of the earth's temperature with the concentration of greenhouse gas emissions),⁷⁷ the consequences of projected climate change,⁷⁸ and the suggested actions to avoid these dangerous consequences remain unresolved.⁷⁹ As a result, the design of a legal regime to mitigate climate change must be sufficiently flexible to respond to new scientific information that can inform the development of a new legal regime.

Like science, an understanding of technologies capable of mitigating climate change continues to evolve. This means that a legal regime that seeks to address this issue must factor in the capabilities and limitations of current and commercially deployable technology.⁸⁰ For instance, Australia's renewable electricity scheme permits a large number of sources to participate in this scheme.⁸¹ By providing a wide eligibility net, the Australian renewable electricity scheme supports not only the technologies that are currently regarded as dominant (such as solar, hydro and wind), but it also encourages the participation (and development) of non-dominant technologies. Further, the underlying legislation in Australia specifically contemplates that the list of eligible renewable electricity sources can be changed. Together, the broad scope for eligibility combined with the design flexibility to include new technologies indicates that this scheme is sufficiently flexible to be able to respond to technological and scientific developments.

⁷⁵ Richard B Stewart, 'A New Generation of Environmental Regulation?' (2002) 29 *Capital University Law Review* 21, 29. See also J Clarence Davies and Jan Mazurek, *Pollution Control in the United States: Evaluating the System* (Resources for the Future, 1998).

⁷⁶ Intergovernmental Panel on Climate Change, above n 2, 10.

⁷⁷ Gerard H Roe and Marcia B Baker, 'Why Is Climate Sensitivity So Unpredictable?' (2007) 318 *Science* 629, 629.

⁷⁸ See, eg, Intergovernmental Panel on Climate Change, above n 6; Hansen, above n 6; Joel B Smith et al, 'Assessing dangerous climate change through an update of the Intergovernmental Panel on Climate Change (IPCC) "reasons for concern"' (2009) 106(11) *Proceedings of the National Academy of Sciences* 4133; Zuebin Zhang et al, 'Detection of human influence on twentieth-century precipitation trends' (2007) 448 *Nature* 461

⁷⁹ See, eg, Mann, above n 6; Richard H Moss et al, 'The next generation of scenarios for climate change research and assessment' (2010) 463 *Nature* 747; Malte Meinshausen et al, 'Greenhouse-gas emission targets for limiting global warming to 2°C' (2009) 458 *Nature* 1158; Klaus Keller et al, 'Avoiding dangerous anthropogenic interference with the climate system' (2005) 73 *Climate Change* 227; Stephen H Schneider and Michael D Mastrandrea, 'Risk, Uncertainty, and Assessing Dangerous Climate Change' in Stephen H Schneider et al (eds), *Climate Change Science and Policy* (2010) 162.

⁸⁰ See, eg, Prins et al, above n 5; Roger Pielke Jr, 'The British Climate Change Act: a critical evaluation and proposed alternative approach' (2009) 4 *Environmental Research Letters* 1.

⁸¹ *Renewable Energy (Electricity) Act 2000* (Cth), s 17. The eligible technologies under the Australian RET scheme are: hydro, wave, tide, ocean, wind, solar, geothermal-aquifer, hot dry rock, energy crops, wood waste, agricultural waste, waste from processing of agricultural products, food waste, food processing waste, bagasse, black liquor, biomass-based components of municipal solid waste, landfill gas, sewage gas and biomass-based components of sewage.

Finally, an appropriately designed legal framework to mitigate climate change must set *quantifiable and achievable targets for the reduction of greenhouse gas intensity*.⁸² These targets must comply with the available technological capabilities and correspond with scientifically determined environmental objectives.⁸³

Choosing to use greenhouse gas intensity as the environmental benchmark is necessary because, by doing so, it targets the emission-intensive fuels and technologies that contribute to climate change and not merely the greenhouse gases emitted following combustion of these fuels.⁸⁴ Contrary to the *Kyoto Protocol*, this approach recognises that the human activities that produce greenhouse gas emissions are the cause of climate change that must be replaced by low-emission-intensity technologies. For this reason, when setting the target for greenhouse gas intensity, it must be sufficiently stringent to ensure that existing emissions-intensive technologies are replaced by technologies that are more efficient.

A legal response to the problem of climate change which is premised on these four principles – a judicious combination of legal instruments, flexibility, legal coherence and quantifiable and pragmatic reductions of greenhouse gas intensity – provides the legal foundation for a new national legal model to effectively mitigate climate change. The principles have been deliberately designed to remain malleable while, at the same time, immune from jurisdiction-specific issues. By using these four key principles as the base from which to construct a new national legal framework to replace the *Kyoto Protocol*, emerging national legal regimes will immediately share a degree of consistency which is likely to make the long-term objective of developing a new global framework developed from the bottom-up more achievable.

III CONCLUSION

The application of Hardin's tragedy of the commons to the problem of climate change presupposes that the only effective response to this problem requires a global solution. It is on this basis that the *Kyoto Protocol* was designed. While the theoretical foundations for global action on which the *Kyoto Protocol* is premised are sound, the execution is misguided. As a result, this instrument is incapable of mitigating climate change. This article has proposed a new legal regime that emerges from the bottom-up, rather than one which is imposed from the top down. By doing so, nation-states can rely on their sovereign powers to provide the catalyst for the construction of a new and effective legal response to this problem.

While national action to mitigate climate change does not strictly adhere to the principles propounded by Hardin, this approach provides the autonomy and flexibility for nation-states to develop legal responses that reflect their jurisdictional particularities. By doing so, these national legal regimes can provide the momentum for legal responses which encompass a

⁸² Greenhouse gas intensity refers to the amount of greenhouse gas emitted per unit of gross domestic product ("GDP") and is determined by an understanding of a country's energy intensity – which is the amount of energy consumed per unit of GDP – and the fuel mix of its electricity sector (see Timothy Herzog, Kevin A Baumert and Jonathan Pershing, 'Target: Intensity - An Analysis of Greenhouse Gas Intensity Targets' (World Resources Institute, 2006), 3). Energy intensity reflects a country's energy efficiency levels and its economic structure. For example, a country that relies on heavy industry is likely to have higher energy intensity than one whose service sector is dominant. Fuel mix refers to the equivalent carbon dioxide ("CO₂-e") content of electricity consumed. This means that countries that rely predominantly on fossil fuels to generate electricity (which have a very high CO₂-e content) are likely to have higher greenhouse gas intensities than countries that rely on non fossil fuel-sourced power to generate electricity (see Timothy Herzog, Kevin A Baumert and Jonathan Pershing, 'Target: Intensity - An Analysis of Greenhouse Gas Intensity Targets' (World Resources Institute, 2006), 5).

⁸³ Pielke, above n 80, 1.

⁸⁴ Setear, above n 17, 179.

broader jurisdictional scope and which, over time, can trigger an international response to mitigate climate change. The purpose of this article, therefore, has not been to denigrate the concept of cooperative and global action as a response to climate change, as this type of approach remains the optimal solution. Rather, this article's purpose has been to suggest a new principled approach to deliver an effective global response to the problem of climate change that emerges from the bottom-up.

The second section of this article explored the four core principles that must underpin any national effort to mitigate climate change. These principles, while providing autonomy and flexibility to individual jurisdictions, ensure that the emerging national legal regimes respond to climate change in a consistent manner. It is important to recognise that these principles are not exhaustive as there may be other factors relevant to the needs of individual jurisdictions. However, by providing a list of core legal principles it provides a useful starting point from which to construct a national, and ultimately international, legal response to climate change.